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THE MOVEMENT OF WHEAT-GROWING: A STUDY OF A LEADING STATE.

AMONG the problems that arise in a study of wheat-farming are (1) the cause of the westward movement of wheat-growing and (2) the size of the most economical wheat farm. An attempt will be made in this paper to apply to the above problems the results of a study of a typical wheat State.

The following table indicates the growth of wheat-growing in Minnesota and her rank as a wheat-growing State:—

	<i>Bushels.</i>	<i>Rank.</i>
1850	1,401	
1860	2,186,993	
1870	18,866,073	12
1880	34,601,030	9
1890	52,300,247	6
1901	80,102,627	2

Crop failures in Kansas in 1902 gave Minnesota first rank for that year

The growth thus made apparent has not been uniform, however. In 1860 each of the nine leading counties produced above one hundred thousand bushels, as follows:—

	<i>Bushels.</i>
1. Fillmore	391,350
2. Olmstead	232,469
3. Dakota	173,652
4. Winona	166,950
5. Goodhue	152,348
6. Hennepin	135,715
7. Rice	130,433
8. Wabasha	114,227
9. Houston	108,518

The counties mentioned are in the extreme south-east portion of the State, or near the Mississippi River in the region of the twin cities (St. Paul and Minneapolis).

In 1870 the leading wheat counties produced as follows:—

	<i>Bushels.</i>
1. Olmstead	2,117,054
2. Goodhue	1,815,403
3. Fillmore	1,687,424
4. Wabasha	1,476,643
5. Dakota	1,435,361
6. Winona	1,315,012
7. Blue Earth	725,879
8. Mower	673,017
9. Dodge	634,741

It is thus seen that in 1870 the leading wheat counties continued to be practically the same as in the previous decade. Six of the counties were now producing over a million bushels each; while the leading county, Olmstead, containing only 648 square miles of territory, produced over two million bushels, or 3,268 bushels per square mile! This product becomes significant when we notice that thirty years later—in 1900—the two leading wheat-producing counties, Polk and Ottertail, produced only 1,362 and 1,791 bushels per square mile, respectively.

In 1880 conditions within the leading wheat counties remained practically unchanged, though additional wheat fields, during the intervening years, had been added along the Minnesota River and in the central and north-western parts of the State. While the wheat industry had thus been practically at a standstill in the older counties, the increase in the total output of the State—from 18,866,073 bushels in 1870 to 34,601,030 bushels in 1880—came from new counties into which the industry had been extended.

In 1890 there were twenty-two counties that produced over one million bushels each. Of these the leading ones were Polk, Ottertail, Stearns, Renville, Lac qui Parle, Sibley, Meeker, Blue Earth, and Brown Counties. All of these lie in the western half of the valley of the Minnesota River, or on the plains in the central western part of the State, or in the valley of the Red River of the North.

In the mean time there was a rapid falling off in the older counties, as is indicated in the following table:—

	<i>Product in 1870. Bushels.</i>	<i>Product in 1890. Bushels.</i>
Goodhue	1,815,403	604,327
Fillmore	1,687,424	156,728
Wabasha	1,476,643	305,388
Olmstead	2,117,054	198,992
Dakota	1,435,361	64,806
Winona	1,315,012	466,845
Mower	673,017	108,763
Houston	623,557	129,619
Dodge	634,741	132,900

Coming down to the year 1900, we find that there were forty-two counties producing more than one million bushels each; and, out of these, twelve counties produced more than two million bushels each. The nine leading counties are given below:—

	<i>Bushels</i>
Polk	4,128,620
Ottertail	3,941,120
Renville	3,698,160
Lac qui Parle	3,219,230
Stearns	3,022,230
Clay	2,593,390
Yellow Medicine	2,552,700
Redwood	2,529,620
Marshall	2,225,440

Thus the tendency of the wheat industry to shift northward and westward, as shown in the figures for 1890, is still further emphasized by those for 1900. Figures since 1900 show further movement in this direction. The valley of the Red River of the North, that part of the valley of the Minnesota River north-west from Blue Earth County, together with the plains lying immediately north and in the central western part of the State, accordingly comprise to-day's great wheat-producing areas in Minnesota.

We are now led to inquire why such a shifting of the wheat industry has taken place. The answer to this query is important; for it explains not merely the cause of changes in farming within the confines of the State of Minnesota, but it will also account for that larger movement of the

wheat industry from New York to Ohio and Illinois and thence to the great North-west and the Pacific coast.

If we examine the kind of farming carried on in the south and south-east portions of Minnesota to-day, we will notice that it is highly diversified. Creameries or cheese factories are found in every township. Barley, corn, or hay, is raised in place of wheat; and these products are not sold in the market directly, but are fed to cattle and hogs on the farm. The cattle are not raised primarily for beef, but rather for the milk from which butter and cheese—the direct products for the market—are derived. Meat, hides, etc., from the cattle—so far as they are marketed—serve in reality as a by-product.

Why have these farmers abandoned wheat-raising and taken up dairy-farming? The land is just as fertile here as in any part of the State. Just as many bushels of wheat per acre were raised in Olmstead County in 1870 as can be raised to-day on the best wheat lands of the Red River valley. The land in Olmstead County is as fertile now as it was thirty-five years ago. It is not, therefore, a difference in fertility or adaptability in soil or condition of climate that has caused the change. Neither can it be due to a difference in the contour of the land. The southern and south-eastern counties of the State contain plains upon which modern agricultural machinery can be used as easily as in the Red River region. The cost of agricultural machinery, the price of wheat, the cost of farm labor, and the rate of interest charged on farm loans are all such as to give a relative advantage to the farmers in the south-eastern counties rather than to those further north-west. The cause of the change must, therefore, be sought elsewhere.

When the south-eastern counties of the State were first settled, wheat-growing was the kind of farming adopted. As the settlements were gradually extended northward and westward, each locality in its turn adopted wheat-growing at first. It follows that wheat production was deemed best adapted to the conditions of frontier agriculture.

There are, however, certain localities in Minnesota, not on the frontier, which are nevertheless devoted to wheat-raising. Mention has been made of that part of the valley of the Minnesota River north-west from Blue Earth County. What does this region have in common with that on the frontier that it should be devoted to wheat production, while other localities have changed their mode of farming to that of dairying?

Those who recall J. S. Mill's theory of international exchange, as illustrated by the example of the five islands, will remember that each of his islands produced that in which it had a relative rather than an absolute advantage over the others. Similarly, it is evident that, when a man has a choice between dairy and wheat farming, he will choose whichever makes it possible for him to employ most efficiently the productive forces involved. On the frontier and along the valley of the Minnesota River north-west from Blue Earth County wheat-farming seems to pay better than dairy-farming. In the south-eastern counties, however, wheat cannot be grown profitably, though just as good crops can be grown, with just as little labor, as in the North-west. But, since wheat-growing does not pay so well as dairying, it is evident that no one could afford to use his land for wheat-growing. Even if, as is often the case, the farmer is a successful wheat-grower, but entirely unfitted for dairying, still he could not afford to grow wheat for the reason that the land has become too valuable, because of its adaptability for dairying. He cannot afford to hold the land for wheat-growing when others will offer him what it is worth to them for dairying.

On the frontier the land is more valuable for wheat-farming. Now in either of these two kinds of farming the productive forces involved are land, labor, and capital. The farmer will ordinarily raise the product which, after paying rent to land and interest on the capital invested, leaves the largest amount of value as wages for his own labor. If either rent or interest be lowered, and the value of the total product remains the same, it follows that the

share going to wages will be increased. Accordingly, if land is free or very low in price, as on the frontier, the farmer will have little or nothing to pay as rent. After paying interest on the capital invested, he can retain what is left as wages. Hence, when a man farms where land is free, the aim will be to extend the use of a given amount of labor and capital over a large area, no additional expense being thereby added in the form of rent. The farmer will select the area from which his labor and capital can get the product of the largest total value possible. He will therefore adopt an extensive kind of farming, such as wheat-growing. As soon, however, as the land acquires a value, thus involving a definite expense per acre (regardless of the value of the product), the farmer finds it necessary to direct his farming so as to get a larger return per acre.

Whether the extensive or intensive kind of farming is the more profitable is thus seen to depend, from the standpoint of an individual farmer, upon the price of the land. The rise or fall in the price of the land depends partly upon the use to which it can be devoted. If one man uses a given area for wheat-raising and some one else thinks he can farm the same area more intensively and realize a larger net return per acre, the latter will be in a position to offer a larger price for the land than the former can afford to pay, or to hold it at if he is the owner. In this way the wheat farmer will be "crowded out" from the higher-priced land or he will change to a more intensive kind of farming.

The question may now be asked, If a farmer can make more money by intensive cultivation on high-priced land, why can he not do the same with the more intensive cultivation on cheaper lands, and thus "crowd out" the wheat industry entirely? The answer has already been suggested. The farmer wants to realize as much value as possible. If by raising corn he can cover only 50 acres in a season, while by raising wheat he can handle 200 acres with the same labor and capital, he figures up which will give in return

the largest amount of value over and above expenses, and decides his plan of farming accordingly. Where land is free or reasonably cheap, the more extensive farming will give the largest net returns, and such farming as wheat-raising will pay best.

We thus see that, while the demand for land and therefore its price are determined partly by the use to which it can be devoted and partly by the general social conditions of the time and place, the price of the land in turn helps to determine the kind of farming that is most profitable from the standpoint of the individual farmer. To the individual farmer, wheat is an unprofitable crop in the south-eastern counties of Minnesota, because the land is too high. From the standpoint of society at large it may be said that the land is too high because other crops are more profitable than wheat. It is the individual farmer, however, who has to choose between the extensive or more intensive modes of farming, and whose decision has determined the movement of the wheat industry. We must look at the question from his standpoint, therefore, if we are to appreciate the cause of the movement. The reason why a man adopting the more intensive modes of farming can crowd out the wheat-farmer is that the former can pay a higher price for the land than the latter, because he can grow a more valuable crop than wheat. On the other hand, the reason why the wheat farmer under such conditions moves to the cheaper lands is that the added expense from increased rent on the high-priced land leaves a smaller net return to him than could be realized if the land were cultivated more intensively, while at the same time larger net returns will accrue by taking up cheaper lands.

This cause of the shifting of wheat-farming as applied to the State of Minnesota accounts for the movement of the wheat belt from east to west across the continent. In a general way the wheat belt of thirty years ago has the same advantages over the West that the south-eastern counties of Minnesota have over those of the Red River valley. There are, however, two other conditions that

have given the West a relative advantage over the East for purposes of wheat culture. Some of the Eastern lands had through long usage been deprived of some of their fertility. This, however, had not been carried far enough to affect materially the movement of the wheat industry. More important than this is the fact that Eastern farms were planned for the early kind of wheat-farming, before binders and reapers had effected the economy of wheat production. The farms were, therefore, so small in size that the individual farmer with his limited number of acres could not utilize the later improved machinery to its full capacity. The force of this will be more fully appreciated when viewed in the light of the subsequent discussion on the most economical size for wheat farms.

We have already noticed that Olmstead County raised more wheat to the square mile of its area in 1870 than was done in our leading wheat-raising counties in 1900. This was at a time when the methods were very different from those of to-day. The binder could not be used for practical service before the early seventies. The farmers in Olmstead County and of Minnesota in general had to resort to the reaper and hire men to bind the grain by hand according to the plan of "binding stations." Four men would each have their quarter of the distance around the field in which all the bundles had to be bound for every round made by the reaper. The large amount of labor needed during harvest is, therefore, evident. When the binder first came into use, it was very expensive. Four hundred dollars was the least it could be bought for at that time. Ten years later the price still stood at a high figure. In the latter year (1880) the father of the present writer paid three hundred and fifty dollars for a wooden-framed Plano binder. It will be interesting to compare farming under such conditions with that of later times.

The census reports afford us figures by counties for the number of farms, acres of improved land, total value of farm implements and machinery, total expenditure to farm labor, and also total value of products. The last-

named item is not given as such, but can be made up from figures for live stock and those for the value of products not fed to stock. The following table is made up from the above-mentioned items:—

COUNTY.	Value of Implements and Machinery per Acre of Improved Land.	Average Number of Acres of Improved Land in the Average-sized Farm.	Average Expenditure for Labor per Acre of Improved Land.	Total Value of Product per Acre of Improved Land.
Olmstead in 1870	\$2.63	84	\$2.44	\$14.24
Olmstead in 1900	1.69	128	.73	13.94
Polk in 1900	1.62	150	1.29	9.43
Lac qui Parle in 1900 . .	1.42	200	.95	9.72
Renville in 1900	1.42	166	.87	10.28

The kind of farming in Olmstead County in 1870 has already been indicated, also that used in this county in 1900. Figures for Polk, Lac qui Parle, and Renville, are selected, because these were the leading wheat counties in the three main wheat sections of Minnesota in 1900.

We thus have before us three types of farming: first, wheat-raising with the reaper,—as seen in Olmstead County in 1870; second, highly diversified farming for products such as butter, cheese, and pork, as seen in Olmstead County in 1900; and, third, wheat-raising according to modern methods as seen in the counties Polk, Lac qui Parle, and Renville in 1900. The contrast in the value of implements and machinery per acre in 1870 and the values for 1900 is due to the very high prices of farm machinery in 1870. When the binders first came into use, the value of implements and machinery per acre became still greater. Thus the figures for this in Renville County in 1880 were \$3.24 per acre. In the comparisons for 1900 the value of implements and machinery per acre is seen to be greatest in Olmstead County. It will be noticed, however, that the average size of farms is the smallest in this county. In the

other counties the same amount of machinery is used on a larger number of acres, and the value per acre is accordingly diminished. For purposes of wheat-farming one set of machinery (one binder, one seeder or drill, one harrow) can do all the work on each of the average-sized farms of the counties referred to above. Where the farms are largest, therefore, and still use "one set," the implements and machinery are used with greatest economy and the value of these per acre becomes least. This explains why the figures for Olmstead County in 1900 are greater than those for Polk County, and also why those of the latter county are larger than those of Lac qui Parle and Renville. The reason why the figures for Lac qui Parle County are not smaller than those of Renville is due to the fact that the farms in the former county are so large that, in a larger number of cases, one set of implements and machinery is not sufficient for the work required. In other words, more than one of some of the implements have to be used for the average farm. As far as the use of capital is concerned, therefore, the figures point to the fact that farms of 160 or 170 acres each are the most economical.

The most economically managed of all wheat farms is that just large enough to utilize one complete set of farm implements and machinery to its fullest capacity. Since one laborer is needed for each set, it follows that in the above plan labor will also be utilized to its fullest capacity. That farm is the best managed and "pays best" on which the labor and capital expended are both thus utilized to their fullest extent. It may be urged that two men and two sets of implements and machinery ought to do just as well and perhaps better on a farm twice as large. They do not, however, for the reason that there is no economy from further organization, since one man with one set of modern farm implements and machinery has all the advantages organization can give. Moreover, when there is just one worker, that worker is in general practice the owner of the farm. Where more than one is needed, resort must be made to hired laborers. The last-named fact is important

in determining why one set is more efficient pro rata than two. The work of an owner is always more careful and less wasteful than that of a hired laborer. The force of this statement can be fully appreciated only by those who have seen the work of the average hired laborer in the harvest field.

Turning our attention now to the average expenditure of labor per acre, we note that the figures for Olmstead County in 1870 are very high. The large amount of labor needed then per acre accounts for this. In the comparisons for 1900 the Olmstead farmer is found to expend less for labor per acre than the farmers of the other counties. His farming, however, is very different from that of the others. His work is largely concerned with stock; and for work of this kind the farmer's wife and children lend, in practice, a very helpful hand. Besides, the work is evenly distributed over the entire year. He gets along with comparatively little hired labor when his farm is of the average size. The wheat farmer, on the other hand, is confronted with certain busy seasons of the year, when a great deal of work must be accomplished in a very limited time. The need of hiring extra labor at such times is obvious. The figures for labor in the three wheat counties are further evidence of the economy of the "one-set" farm of the proper size. It is true that wages per day for hired labor are not the same in the three counties. Thus Renville County is nearest the large cities, and gets labor the cheapest. Polk County is farthest away, and must pay the highest wages. After making due allowance for this, however, the relation still holds, as shown above.

Turning to the total value of the product per acre, we notice that the highest figures are those for Olmstead County in 1870. This was the result of wheat-farming under the reaper régime, and the high figures are due to the exceptionally high price of wheat at that time. The richest farmers in Olmstead County to-day will tell you they got their "start" during those years. Although the value of the product per acre over and above the cost of labor and the

cost of implements and machinery, as determined from the above figures, appears higher in 1900 under diversified farming than in the reaper era under high wheat prices (being \$11.52 per acre for the former and \$9.17 per acre for the latter), notice must be taken of another item of expense not shown in the above table. Reference is made to the wide contrast in the prices of land. This expense was very small in 1870. Now, however, the Olmstead farmer has to pay fifty or sixty dollars an acre for land. (This means with buildings, fences, and other equipment, or total investment necessary to buy a farm.) When rent on this is computed, the advantages of the wheat farmer of 1870 become evident.

We are now in a position to appreciate the meaning of a movement that has taken place in the wheat-farming regions of the North-west during recent years. This is the breaking-up of the bonanza wheat farms. When the experiment on these large farms was first begun, and a long series of machines and implements were put to work on the great plains, the power was so great and the scale of work so large that many believed the most economical method of wheat-farming had been secured, and that farming on a small scale was henceforth doomed to failure. Mere size of industry, however, does not insure efficiency. The latter can only be secured where labor and capital are combined with land in such a way that each is utilized to its full extent. The waste possible in wheat-raising is very great. This fact must be taken into account more and more, as the cost of raising wheat is increased. When land was cheap, the bonanza wheat farmer could let his great caravan of machinery, implements, and labor skim over the plains, and, the more ground they covered, the larger would be the net as well as the gross returns. With a rise in the price of land, however, a new item of expense had to be met, and more value had to be secured from each acre used, if the business was to pay. The bonanza farmer had no way of getting more value from the land per acre. The small farmer, however, could add to the returns by more

careful wheat-farming. He could save waste, and take an owner's interest in the field cultivated.

We thus see that the rise in the price of land, by means of which the diversified farmer crowds out the wheat farmer of southern Minnesota, enables the wheat farmer owning 160 or 170 acres to crowd out the bonanza farmer of the North-west. In either process the movement is toward a kind of farming which produces more per acre. Though the rise in the value of the land is partly the result of the more intensive farming, yet the social and other advantages of a settled community are in themselves powerful factors in increasing this value, and, as already shown, the rise in value in turn forces a more intensive system of farming upon such communities.

The relative advantages of wheat-farming and the more intensive diversified farming can be further compared by means of the following data gathered from the United States census reports of 1900:—

COUNTY.	Total Acres of Land in Farms.	Acres of Improved Land in Farms.	Value of Land and Improvements (except Buildings).	Value of Buildings.
Olmstead	405,889	327,419	\$13,592,810	\$2,684,110
Renville	584,659	500,199	13,563,070	2,358,530

COUNTY.	Value of Implements and Machinery.	Value of Live Stock.	Value of Products not fed to Live Stock.	Expenditure for Labor.
Olmstead	\$555,160	\$2,005,259	\$2,559,762	\$240,630
Renville	709,490	1,908,030	3,235,004	436,920

From the above tables the following has been compiled:—

COUNTY.	Improved Acres in Each Farm.	Total Acres of Each Farm.	Value per Acre of Land in a Farm, taking Total Acres.	Value of Buildings per Acre of Improved Land.
Olmstead	128	159	\$33	\$8.20
Renville	166	194	23	4.70

COUNTY.	Value of Im- plements and Machinery per Acre of Improved Land.	Value of Live Stock per Acre of Improved Land.	Value of Products not fed to Live Stock per Acre Improved Land.	Expenditure for Labor per Acre of Improved Land.
Olmstead	\$1.70	\$6.12	\$7.81	\$73
Renville	1.40	3.81	6.46	.87

Land in Olmstead County is thus valued half again as high as in Renville County. The cost of buildings, implements and machinery, and live stock per acre in Renville is about five-eighths of that in Olmstead County. The total value of buildings, implements, machinery, and live stock per farm in Olmstead County is \$2,050.56. In Renville it is \$1,645.06. The average total land value in each average-sized farm in Olmstead is \$5,247. In Renville it is \$4,462. The total investment in the average-sized Olmstead farm becomes \$7,297.56; in Renville, \$6,107.06.

Deducting the cost of labor per farm from the value of each farm's yearly product, we have \$906.24 as the average income on a farm in Olmstead County, and \$927.94 for Renville.

A man with a capital of a little over \$7,000 can thus buy an average-sized, fully equipped farm in Olmstead County, and his income will be reasonably certain. He could, however, with \$1,000 less, buy a larger farm in Renville County, and get, perhaps, a larger yearly income. This income, however, would not be so certain; moreover, there are certain social disadvantages in living in a new country. A man with sufficient capital, wishing to invest in farm lands where the income is safe from year to year, will prefer Olmstead farms. If, however, one is willing to hazard the risk of steadiness in income for the sake of the probability of a larger yearly return, and at the same time wishes to realize gain from increase in the price of land, preference will undoubtedly be shown for Renville farms. Men who do not own enough capital to buy an Olmstead farm may have enough for a small wheat farm. In this way the poorer farmers tend to settle in the wheat region or on the frontier. All the data presented tend, therefore, to emphasize still further the conclusions already reached.

It remains to be considered whether charges for transportation, alone or with other causes, are of importance in determining which kind of farming is the most profitable. It is true that transportation charges have some effect. Freight charges are higher on a dollar's worth of butter than on a dollar's worth of wheat. If, therefore, all other things are equal, it would pay better to raise wheat than to go into dairying. In the study made of Renville and Olmstead Counties, however, transportation charges cannot be said to have had any influence in determining the kind of farming in the two localities. Renville County has had advantages in transportation that exceed those of Olmstead or Freeborn. All of these counties ship to the large cities. A direct railway line runs through Renville County to St. Paul, and has given this region cheaper transportation than has been accorded the counties further south. If the southern counties were induced to carry on intensive diversified farming because of advantages in transportation, then surely Renville County had a still better reason. The influence of lower transportation charges has been a general one, and has made possible the movement of all industries across the continent. The example of Renville County, however, as compared with the counties further south, indicates clearly that dairying has not been encouraged thereby rather than wheat-farming. It may nevertheless be noted in this connection that, if a new railroad is extended into a certain region, there will be increased demand for the land of the locality and prices of land will go up. If the price of land be raised high enough, so that more intensive farming pays better than wheat-raising, we have a result that can be attributed to changes in transportation. Facilities for transportation have brought about such changes, however, by raising the price of land.

In conclusion, it may be emphasized that with the price of land high enough it is not dairy-farming as such that crowds out wheat-farming, but rather a more intensive that crowds out a less intensive kind of farming.

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